Management of Open Fractures

Traumatic fractures to the appendicular skeleton are common injuries in dogs and cats. Of these, an estimated 5-10% are open fractures. Soft tissue damage associated with these fractures can range from a simple skin puncture to a massive degloving wound. Management of these injuries represent some of the most challenging (and rewarding!) cases veterinary surgeons take on, requiring both determination as well as financial and time commitment on the part of the veterinary team and the owner. This article discusses the general assessment, management, and follow-up for open appendicular fractures.

At several points in this article, I will highlight points which I feel are most salient. Admittedly, these are either tidbits I have learned the hard way, or that I often see forgotten in the process of managing these cases. One of these very key aspects is client education. As early as you can, provide the client an initial idea of timeline, total costs, home care, and the need for repeated assessments and procedures. There is a significant degree of uncertainty in regard to outcome or prognosis of open fractures due to the fluidity of the situation. This requires a revision of the above information, and the owner must know this at the start. As rewarding as cases will be if managed properly, they quickly can become impossible to manage if the owner is not a willing participant in this dynamic and kept well informed.

Prior to treatment of open fractures, the patient must be thoroughly stabilized. Fractures, either open or closed, should be low priority until the patient is stabile. Limbs with obvious soft tissue or orthopedic injury should be avoided for placement of IV catheters, and open wounds should not be manipulated until they can be treated in a controlled manner.

Nosocomial infections are commonly the most challenging to treat, so prevention of contamination is paramount. Until a patient is stable enough for treatment, a light bandage or clean towel may be used to cover open wounds to avoid further contamination. I feel the need to emphasize some more thoughts here: All hospital personnel must wear gloves while handling patients with open wounds. Instruments, clippers, scissors, and other objects that come in contact with these wounds must be thoroughly cleaned/sterilized before and after use. These practices cannot be over-stated, as resolving infection is difficult at best in orthopedic cases. Infection with a virulent strain could be the difference between saving a limb and losing it. These precautions must be started at the initial covering of the wounds, even before they are definitively treated.

Once the patient is stable enough to undergo sedation or anesthesia, attention can be directed to assessment and initial treatment of the wounds. Another reminder about contamination and infection prevention here. Use the the precautions I listed above during assessment, cleaning and debridement of wounds. Wounds should be irrigated with a large amount of sterile saline and low pressure. The intent should be to flush debris from the wound, so care must be taken to avoid pushing contaminants deeper into the wound. Lavage "across" the wound, not "into" it. After initial lavage, coat exposed tissue with sterile lubricant to protect the it before clipping hair. Clip widely, with the understanding that more pathology may be present than is first recognized with hair present. Lavage a second time. If the intent is not to proceed directly to surgery, obtain aerobic and anaerobic culture samples once lavage is complete. Another point of emphasis is the practice of culturing "early and often". Results of these diagnostics always come much later than we want them. By the time we have them, they are outdated. Therefore, whenever there is an increase in signs of infection (discharge, swelling, pain, or fever), the initial thought should be to obtain a fresh sample, or bother the lab about a pending one!

Now, assess the wound:

Open fracture wounds are classified via the following scheme:
Gustilo-Anderson open fracture classification scheme

Injury description
Grade I
Low energy with a laceration < 1 cm (risk of infection 0–2%)
Grade II
Larger wound > 1 cm with minimal contamination moderate soft tissue damage and sufficient soft tissue to cover the bone (risk of infection 2–10%)
Grade III A
Extensive soft tissue injury due to high energy with crushing component, significant contamination and comminuted or segmental fracture configuration, soft tissue is likely to be sufficient for coverage of bone
Grade III B
Extensive soft tissue injury, high energy, massive contamination, comminution and stripping of periosteum present with exposed bone requiring reconstructive techniques
Grade III C
Same as above with neurovascular injury as well
Risk of infection for Grade IIIs 10–50%

Surgical stabilization is recommended for most open fractures, as coaptation requires frequent bandage changes, which compromises the necessary stability for bone healing. Grade I and II can generally be treated with internal fixation, following the same principles as if the fracture were closed. Grade III will have a much higher need for implant removal once the fracture has healed. External skeletal fixation provides the potential benefits of ease of application, allowing continued wound management, minimal disruption of soft tissues, and easy implant removal, and is commonly chosen for a grade III wound. However, internal fixation has the benefit of stability, and may still be chosen for a grade III. It should be assumed that any implant may require removal for an open fracture. Generally speaking, choosing an appropriate method of fixation, which affords stability while preserving what remains of soft tissue, is the objective. This should take into account the necessity to provide ongoing management of the soft tissues. Multiple sessions of lavage should be performed at fracture stabilization surgery. If no culture was performed recently, samples should be taken after lavage.

There is a high priority in open wound cases in reestablishing the soft tissue envelope around all bone an internal implants. In the absence of infection and tension, the soft tissues do this very quickly. Our job as veterinarians is the guidance of this process. This is done by judicious debridement via either surgery or via wet-to-dry bandaging, frequent assessments, and early surgical stabilization of fractures. Surgical debridement of wounds may be done in one session if well timed, but may require additional sessions. Soft tissue reconstruction should only be performed when only healthy tissue remains.

Very simply the goals for management of complex degloving injuries are to prevent or minimize infection, to re-establish the soft-tissue envelope, and to provide skeletal fixation that results in eventual osseous union, all of which are to restore the function of the limb. Unfortunately, these goals result in a complex and fluid decision-making process, which may require total commitment and dedication for veterinarian, owner, and patient. This process may be very time consuming, very expensive and very frustrating for all involved, but with careful and methodical planning, superior client education, and a dedicated team success, can be realized.

Scott P. Hammel, DVM, MS
Diplomate ACVS
Veterinary Surgical Specialists